

Water Transfers Based on Crop Shifting and Crop Idling

How to Make Them Work in the Sacramento Valley in 2002

I. Introduction

The purpose of this and related papers is to provide guidance to local parties who wish to sell water to the State's 2002 Dry Year Water Purchase Program and the Environmental Water Account (EWA)¹ through water transfers². The focus of these papers is water transfers from areas in the greater Sacramento Valley to areas south and west of the Sacramento-San Joaquin River Delta. These papers should not be considered to provide technical guidance for other water source areas. The information in this paper is intended to assist parties in developing the data and materials needed to support agreements for water transfer purchases and water conveyance with the Department of Water Resources (DWR).

This paper was prepared by the Water Transfers Office of DWR. Contributions to this paper were made by technical experts from within DWR and the U.S. Bureau of Reclamation (USBR) and interested parties in the Sacramento Valley. DWR appreciates the assistance of all the individuals who helped produce and review this paper. Those who helped may not agree with all aspects of this paper. However, most agreed that its development would be helpful as DWR begins water supply purchase discussions for the State's 2002 Dry Year Water Purchase Program and the Environmental Water Account (EWA).

For an overview of water transfers for 2002, parties are encouraged to read a companion paper, "Information to Parties Interested in Making Water Available to the Environmental Water Account (EWA) or State's 2002 Dry Year Water Purchase Program." This paper is available by contacting the Water Transfer Office at (916) 651-7054.

¹ The Environmental Water Account (EWA) is a State and federal program established in the August 2000, CALFED Record of Decision to allow additional environmental protection actions with no uncompensated water or power costs to the water users. The water supply costs of the program are made up in part through water transfers.

² These papers are presented to facilitate and expedite the contracting process with DWR for responsible water transfers and are not intended to have regulatory effect.

DWR encourages water transfers as a way to help meet local water supply needs as well as those of the State and the environment. The purpose of this paper is to assist parties interested in conducting water transfers based on the shifting or idling of crops in the Sacramento Valley where the assistance of DWR or USBR is needed to either purchase this water or convey it to users outside the Sacramento Valley. It will be updated as experience is gained in the future.

Water transfer proposals that are not responsive to the contracting guidance presented in this paper will not be included by DWR in the 2002 Dry Year Water Purchase Program or the 2002 Environmental Water Account Program. Such proposals may be pursued independently. However, DWR and USBR reserve all rights to protest any such proposals that adversely affect the water rights they hold.

II. Overview of Crop Shifting/Crop Idling Water Transfers

A central objective of any water transfer program based on crop shifting or idling is to reduce the consumptive use of surface water applied for irrigation. While such a program is not required to document a one-for-one reduction in surface water diversions, each proposal needs to make a credible case that reductions in surface water diversions will occur consistent with the reductions in consumptive use of applied surface water.

California law protects other existing water users, the environment and (in many cases) the source area economy when water is transferred.³ The effects of a water transfer involving crop shifting or idling are evaluated from the conditions that would exist absent the water transfer. These conditions are used as a baseline to determine the water supply benefits of the transfer.

³ California Water Code Section 1810 *et seq.*, specifies the requirements that must be met in order for DWR and other regional and local agencies to allow use of their conveyance facilities. Also, Water Code Sections 386, 1702, 1706, 1727 and 1736 follow the common law and establish similar requirements for changes in water rights. Strictly speaking, economic issues are typically only required to be evaluated in water transfers that seek to utilize DWR's water conveyance facilities or those of other State or local agencies. However, economic impacts that are associated with physical changes to the environment may require analysis under the California Environmental Quality Act (CEQA).

Crop shifting and idling should be done in a manner that protects the local and regional economy. Decisions to modify cropping patterns are made by the local water user. Crop idling should be limited in the amount of land included in the program and done when necessary for water supply purposes. This paper provides technical guidance for crop shifting and crop idling programs performed in water years of below normal precipitation. Long-term arrangements for programs related to crop idling in above normal and wet years are beyond the scope of this paper and need additional evaluation. Limiting the number of years acceptable for such a program is intended to help protect the local farm economy and to avoid some environmental impacts.

III. Estimating Conditions That Would Occur Absent the Program

A key element of a crop shifting and crop idling program is to determine the conditions that would exist absent the program. Predicting such conditions accurately is often difficult. The use of historical cropping patterns is currently the best method to estimate conditions that would exist absent the crop shifting and crop idling program.

Accurate crop records for five years immediately preceding the transfer need to be provided to document crop history for either individual farms or large water districts that wish to participate in a crop shifting or crop idling program⁴. This crop history is needed to identify the type of crops typically grown in the area, degree of typical land fallowing that takes place, and typical crop rotation practices. In the event that five years of crop records are not available, reliable alternative methods for documenting crop history are needed. As discussed below, the requirement to provide five years of crop records is not intended to pre-determine the appropriate baseline for determining the reduction in consumptive use associated with any specific transfer.

⁴ Crop acreage should be reported in net field acres of the actual farmed and irrigated acres. If only gross field acres are known (i.e., the county parcel acres), then multiply the gross acres by 0.95 to estimate net acres. Crop acreage needs to be included for each crop (include fallowed lands and non-irrigated crops) for the water district or individual farm operation.

Individual farm operations and larger water districts present different opportunities and challenges for determining and reporting on conditions that would have existed absent the water transfer. Individual farm operations need to provide the crop history and maps for each land parcel participating in the program in a format acceptable to DWR and USBR. For large water districts, the crop history for the entire water district is needed, along with district acreage each year and district maps.

A. Large Water Districts⁵

For large water districts, crop rotation issues are typically not an issue due to the large area involved and the mix of different farming choices practiced within the district. However, crop choices vary year-to-year and it is difficult to predict with any accuracy future conditions absent a crop shifting and crop idling program. The best indicator of next year's crop patterns is some representation of the recent past. Large water districts interested in a crop shifting and crop idling program need to provide an accurate record of crops acreage, fallowed land, dry farmed and total acres within the entire district for the last five years. If only a few individual landowners within the water district wish to participate in the program, they should coordinate with their water district and refer to section B below on methods to calculate expected water savings. However, using water district totals is less data intensive and easier to develop if numerous landowners are involved.

The previous year's crop acreage of a water district is presumed to be the best indication of the next year's crop patterns provided the water supply has not been affected by droughts and the acreage of the one or two highest water using crops is typical of past years. The average acreages for these high-water-using crops in each district needs to be reviewed. If acreage values for these high-water-using crops for the immediate prior year are within five percent of the five-year average for these crops, then the last years cropping patterns will be used as the base for calculating changes due to the crop shifting and idling program. If the highest water using crop acreages fall outside this

⁵ The term water district is used in this paper as shorthand to include any water company, district, or other entity that provides water service to a group of landholders and can enter into a binding contract with DWR.

range, then another more typical year or an average of cropping patterns and acreages will be used as mutually agreeable between DWR, USBR and the parties proposing the water transfer. The previous year's data may also be used if additional explanation is provided and DWR and USBR and the parties proposing the transfer agree that this is the best representation of conditions that would exist absent the crop shifting crop idling program. If agreement among DWR, USBR and the water district cannot be reached on an estimate of the conditions that would likely exist absent the crop shifting and idling program, then DWR will not participate in the proposed crop shifting or idling program that year with that particular water district.

Agreement between DWR and USBR on the method to determine the water made available from a crop shifting and crop idling program is essential. These two agencies are responsible, as a condition of their water right permits for meeting water quality and related flow standards in the Sacramento-San Joaquin Delta. This requires an equitable basis of splitting in-basin water demands between these two projects. This is done under the Coordinated Operations Agreement (COA) between these two agencies. If in-basin demand is reduced by a crop shifting and crop idling program, appropriate credit under the COA needs to be given to the entity that caused the reduction. When this is done, this credit can be tracked through the Delta. Any crediting under the COA for water transfers is done by mutual agreement of DWR and USBR. Without such agreement the water transfer cannot be properly credited and tracked through the Delta.

B. Individual Farm Operations and Small Water Districts

For individual farm operations or small water districts, crop rotation patterns can make the use of last year's cropping patterns an inappropriate measure of likely future conditions absent the crop shifting/idling program. The previous five years of crop history will help identify significant crop rotation cycles. In cases where crop rotation cycles are evident for the whole of the farm operation or small water district, the use of either (1) a repeating crop pattern or (2) the five-year average should be used. In these cases, specific fields to be enrolled in the program need to be identified and the five-year crop history for these fields provided.

Use of a repeating pattern to characterize routine land fallowing and crop rotation practices requires the proponent to provide an exact repeating pattern of crop/land fallowing practices for the fields to be enrolled in the program. A minimum five-year record is required to establish the pattern. The lands considered routinely fallowed would correspond to those in the subsequent year of the pattern.

Using the five-year average to characterize routine land fallowing practices requires the proponent to provide the most recent five-year record of crop/land fallowing practices of the fields to be enrolled in the program. From this crop history, the five-year average crop/fallowing evaporation of applied water (ETAW) values would be calculated as indicated below for each field. The five-year average ETAW values for each field would be used as the base for determining changes due to the proposed crop shifting and crop idling program in the year of the transfer.

In addition to the historic crop acreage, the individual farm operation or small water district that as a whole shows significant crop rotation patterns needs to provide the following information: (1) the basis of right to use surface water during the spring and summer in the year of the proposed water transfer, (2) maps showing landownership boundary, current fields irrigated, fields routinely fallowed or not irrigated and fields to be idled as part of the proposed water transfer (maps at a scale of 1:24,000 are preferred), (3) aerial photographs

from available sources like
[ttp://terraserver.homeadvisor.msn.com/default.asp](http://terraserver.homeadvisor.msn.com/default.asp), and

<http://www.waterplan.water.ca.gov/landwateruse/landuse/ludataindex.htm>, and

(4) a statement that water saved on the fields enrolled in the crop shifting/idling program will not be used in other areas under the control of the farm operations participating in the program.

Due to staff limitations in 2002, the highest priority for contracting will be given to entities that have the technical aspects of their proposals in order to demonstrate that significant quantities of water will be made available for transfer. A 5,000 acre-feet water transfer agreement takes almost as much staff time to process as a 50 acre-feet agreement. Parties are encouraged to work with existing water districts and water agencies to develop joint water transfer proposals. Individual farm operations are encouraged to assemble their data so that it can be efficiently evaluated.

IV. Use of Evapotranspiration of Applied Water (ETAW)

A. What is ETAW?

The calculation of water made available for transfer is based upon the quantity of surface water conserved for each qualifying idled acre of cropland and the crop acreage calculated above. The quantity of surface water conserved varies according to changes in the evapotranspiration of applied surface water (ETAW) associated with changes in the crops grown or lands idled due to the implementation of the crop shifting and crop idling program.

The use of ETAW does not include possible surface water savings of extra irrigation water typically applied and lost as deep percolation to groundwater or possible reductions in ditch conveyance losses. The quantification of these possible savings is difficult. In addition, some of the “losses” to groundwater may make their way back to the surface water system. Therefore, the use of ETAW is a conservative yet reasonable estimate of surface water savings due to crop shifting

or idling until better information becomes available to quantify these losses.

ETAW values used to calculate water made available for transfer are developed by DWR. ETAW is defined as the portion of the total evapotranspiration that is provided by irrigation. The portion of the crop evapotranspiration met by precipitation occurring during the growing season or stored as soil moisture within the root zone before the growing season does not qualify as transferable water. Although the quantity of applied surface water required to support a given crop may vary from one year to the next as a result of changing weather conditions, ETAW values used for water transfer calculations are based upon crop water requirements reflecting average rainfall and evaporative demand.

DWR calculates normal year ETAW values using information and methodologies from established sources. To estimate crop evapotranspiration (ET), an evaporative demand index such as pan evaporation or reference evapotranspiration is adjusted by applying unique crop coefficients that have been calculated from studies over many years by the University of California Cooperative Extension, the U.S. Department of Agriculture, Agricultural Research Service, and DWR. Pan evaporation is measured using U.S. Weather Bureau Class A pans following standardized procedures and located in standardized environments.

In areas for which long-term pan evaporation data are unavailable, reference evapotranspiration is calculated using weather data collected by automated weather stations of the California Irrigation Management Information System (CIMIS). These calculations are subsequently adjusted to provide consistency with the long-term pan data and pan-based crop coefficients. Additional data utilized to estimate crop ETAW values include long-term precipitation records, representative crop planting and harvest dates, rooting depths and soil water-holding capacity data from soil surveys of the USDA Natural Resources Conservation Service. These crop ETAW values, developed by DWR for updates of *Bulletin 160, The California Water Plan*, are periodically revised as additional information becomes available.

Crop ET is initially calculated based on the assumption that the crop is well watered and is consuming water close to its physiological potential. This initial ET value is adjusted to reflect prevailing cultural and irrigation practices used in production agriculture that in some cases reduce ET below the physiological potential. In addition, ETAW values may be reduced for areas where shallow groundwater contributes to crop ET.

B. ETAW Values and Limitations on Crops and Lands

The ETAW values for crops in the Sacramento Valley have been estimated by DWR and USBR for use in year 2002 water transfers. These values are shown in Table 1 (see second-to-last page). The values will be refined in the future as additional information becomes available.

Experience has shown that some crops, lands and agricultural practices need to be avoided in developing a crop idling or crop shifting program. The specific reasons for avoiding them vary, but all relate to the difficulty in determining the real savings in water if they are included in the program. Table 2 (see last page) lists several crops not suitable for shifting or idling as a means of making water available for transfer. Also, specific lands and practices need to be avoided in order to have a crop shifting or idling program acceptable to DWR and USBR. The lands and practices not acceptable in a crop shifting and idling program for 2002 are listed below:

- The idling of irrigated pasture or alfalfa crops that cannot be easily verified by metered use of applied surface water and drainage water.
- Removal of permanent crops.
- Fields irrigated by groundwater.
- Crop shifting on lands located where groundwater is within five feet of the land surface or where the crop root zone may extend into the groundwater table. In these areas, crop idling is the preferred practice and weed control may be needed if ambient weed roots are able to reach the groundwater table.

- Where increased water use on other lands within the transferring water district or within the control of the transferring party offsets the volume of water conserved through crop shifting or crop idling.

V. Estimating Water Available for Transfer

A. Large Water Districts

A large water district needs to evaluate the crop acreage that would have existed absent the transfer using the methods presented above. This includes the acreage for each crop, fallowed lands and other lands. The ETAW values from Table 1 need to be used to calculate ETAW for the district. Both DWR and USBR need to approve the method used to develop this base for further calculations. The water district then needs to evaluate the willingness of participating farmers to modify their operations to make water available for transfer. The crop acreages expected in the coming year are determined for each crop, fallowed lands and other lands. Using these acreages, the ETAW for the coming year is calculated by the same method used for the base year acreage. The base and expected current year crop acreages for the district are checked to make sure they match. The difference between the base and current year ETAW is used to estimate the water made available by the crop shifting and crop idling program.

B. Individual Farm Operations or Small Water Districts

As stated in "Section III B." individual farm operations and small water districts may exhibit significant crop rotation sequences and may wish to simply enroll specific land parcels into a crop shifting/crop idling program. In these cases, the crop history for each land parcel enrolled in the program needs to be evaluated separately. Either of two methods can be used to establish the baseline for estimating the amount of water made available due to the crop shifting/crop idling program for individual land parcels. These are the: (1) repeating pattern or (2) the five-year average as discussed in Section III B. The baseline ETAW for each parcel is established. The ETAW for the parcel for the current year is then established. The difference between the base and current year ETAW is used to estimate the water made available by the crop shifting/crop idling program.

VI. Limitations on the Water Made Available for Transfer

Water made available through crop shifting and crop idling for water transfer purposes occurs in the late spring and summer on a pattern that follows the ETAW of the crops involved. This water could be used directly by others with appropriate changes in the direct diversion water rights of the party transferring the water. This water can also be transferred through the Delta during times when capacity is available at the CVP or SWP pumping facilities. However, this capacity often fluctuates during the summer. There are often pumping capacity "windows" that open and close during the summer due to the needs of CVP or SWP for this capacity, fish concerns, water level issues in the Southern Delta, or other factors.

Water made available through a crop shifting and idling program can also have value to DWR or USBR for south-of-the Delta uses if it occurs during balanced conditions in the Delta or helps meet instream river flow requirements of DWR or USBR upstream of the Delta. In order to make this water useful in a water transfer south or west of the Delta for DWR or USBR, these daily water supply savings need to be stored or otherwise credited during the summer.

Historically, this crediting has occurred upon prior arrangement and agreement with DWR or USBR, as part of their water purchase programs. The use of this crediting mechanism in water purchases for crop shifting and crop idling effectively means that DWR and USBR are using their water rights to appropriate water foregone due to the water purchases. DWR and USBR must be convinced that these programs are appropriate for crediting in order for them to use their water rights in this fashion in their water purchase programs. Use of the procedures presented in this paper generally satisfies this concern.

Also, the value of the water saved through crop shifting and crop idling is diminished in wet years when balanced conditions during the summer are more limited. These types of transfers are best suited for water years of below normal precipitation.

VII. Adjustments for Water Shortage Years

During very dry years, water districts that may wish to participate in a crop shifting/idling program may be facing water shortages. Under this situation only the additional acreage beyond that reduced by the water supply shortage will be included in the program. This acreage will be determined on a case-by-case basis assuming that the lowest value, highest water using crops are the ones reduced due to water supply shortages.

VIII. Continuation of Normal Farm Practices

Any crop idling needs to be dispersed to minimize impacts on terrestrial wildlife and waterfowl species that may use irrigated croplands or irrigation/drainage ditches for temporary or permanent forage and habitat purposes. Normal farm operations for idled lands are expected to continue. Idled land cannot be irrigated to get the full credit of the expected water savings. Special actions on idled lands to remove weeds that utilize available soil moisture from rainfall are not required in the Sacramento Valley except in areas with very high water tables. The loss of rainfall-provided soil moisture due to weeds on the Sacramento Valley floor is not considered a significant water supply loss given the possible benefits to wildlife of not taking special actions to remove these weeds. However,

seepage from surface water sources to idled areas will be subtracted from the amount of water supply credit given to these areas.

IX. Protection of Water Rights

California law protects the underlying water rights of those parties who wish to transfer a portion of their surface water supply to others. California Water Code Section 1745 *et seq.*, protects the underlying water rights from forfeiture for water transfers to the State's Dry Year Water Purchase Program and other programs. In addition, DWR purchase agreements expressly recognize the legal protections afforded the seller's underlying water rights. Additional information about water rights protection and water transfers is available in the "Guide to Water Transfers" published by SWRCB staff and available on SWRCB web site at www.waterrights.ca.gov.

X. Reporting

Accurate reporting of the activities undertaken as part of a crop shifting and crop idling program is another essential provision of any water transfer program agreement. Reporting is the responsibility of the seller and needs to be acceptable to DWR.

XI. Verification

Verification of the activities taken to make water available through a crop shifting or crop idling program may be conducted by DWR. Sellers will need to allow access to fields by DWR staff for verification purposes. DWR will coordinate verification activities with USBR.

XII. Effects on the Economy of the Local Community

Crop shifting and crop idling programs have the potential to affect the local economy if they are taken to an extreme. Those parties that depend on farming related activities can experience some decrease in business if land idling becomes extensive. Studies by RAND after the 1991 dry year in

which over 800,000 acre-feet were transferred could not detect overall economic impacts due to the crop idling programs that year in part due to the significant economic conditions being experienced at the time. Over 150,000 acres were taken out of agricultural production that year to support water transfers. In 2001, rice acreage was reduced by about 35,000 acres in the Sacramento Valley as a direct result of crop shifting and crop idling programs. This was less than a 10 percent decrease in rice acreage from the previous year. The economic effect of this decrease on the overall economies of the individual counties in which it occurred was calculated by DWR staff to be much less than one-percent.

Water districts and others participating in crop shifting and crop idling programs need to be sensitive to the possible economic impacts of their actions on their business partners and their neighbors. Geographically distributing the acres that are idled can avoid or minimize possible economic effects. In addition, water districts and individuals that receive funds from the sale of water related to these programs are encouraged to continue their normal business practices of investing income back into their operation and as much as possible, within the local economy. These reinvestments may not benefit those possibly affected by the crop idling program but can help offset overall economic impacts in the county.

DWR will monitor the cumulative economic effects of crop shifting and crop idling programs in 2002 in the Sacramento Valley. DWR will either limit its participation in crop idling programs for water transfer or take specific actions to ensure that the overall economic effect in individual counties where such programs are implemented does not become unreasonable.

XIII. Hearing if Crop Idling Exceeds Certain Levels

Water Code Section 1745.05 (b) provides that if the amount of water made available by land fallowing (idling) exceeds 20 percent of the water that would have been applied absent the proposed water transfer, a public hearing by the water supply agency is required. This code section applies to water transfers to the State's Dry Year Water Purchase Program. In the past, crop idling programs have stayed well below the 20 percent water delivery threshold for a hearing. Water supply agencies interested in participating in

DRAFT

March 8, 2002

a crop shifting and crop idling program need to be aware of this water code section and conduct a public hearing if they propose a program where crop idling exceeds the 20 percent threshold.

Table 1

Estimated ETAW Values (in acre-feet / Acre)
for Various Crops⁶ suitable for Shifting or Idling in 2002

Crop	ETAW (in AF/Acre)
Bean	1.5
Corn	1.8
Cotton	2.3
Melon	1.1
Milo	1.6
Onion	1.1
Pumpkin	1.1
Rice	3.3
Rye Grass (Winter Irrigation)	0
Safflower	.7
Sudan Grass	3.0
Sugar Beets	2.5
Sunflower	1.4
Tomato	1.8
Vine Seed/ Cucurbits	1.1
Wheat (over wintered)	.5
Wild Rice	2.0

⁶ For use in 2002 in the Sacramento Valley only

Table 2

Estimated ETAW Values for Various Crops
Crops NOT suitable for Shifting or Idling in 2002
(See Section IV.B)

Crop	ETWA (in AF/Acre)
Alfalfa	3.0 ⁷
Almonds	2.7
Pasture	3.3
Prunes (Deciduous Orchard)	2.5
Walnut	2.6

⁷ The ETAW for Alfalfa can vary greatly depending on the amount of applied water